WindFloat Feasibility Study Support

Cooperative Research and Development Final Report

CRADA Number: CRD-11-419

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<u>**Cooperative Research and Development Final Report**</u>

In accordance with Requirements set forth in Article XI, A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

<u>**Parties to the Agreement**</u>:   Principle Power, Inc.

<u>**CRADA Number:**</u>   CRD-11-419

<u>**CRADA Title**</u>:   WindFloat Feasibility Study Support

<u>**Joint Work Statement Funding Table Showing DOE Commitment**</u>:

Estimated Costs	NREL Shared Resources
Year 1	$ 40,000.00
Year 2	$ 45,000.00
Year 3	$ 14,000.00
Mod 2	$ 350,000.00
TOTALS	$ 449,000.00

<u>**Abstract of CRADA Work**</u>:

This shared resource CRADA defines research collaborations between the National Renewable Energy Laboratory and Principle Power, Inc. and its subsidiaries ("Principle Power"). Under the terms and conditions described in this CRADA agreement, NREL and Principle Power will collaborate on the DEMOWFLOAT project, a full-scale 2-MW demonstration project of a novel floating support structure for large offshore wind turbines, called WindFloat. The purpose of the project is to demonstrate the long-term field performance of the WindFloat design, thus enabling the future commercialized deployment of floating deepwater offshore wind power plants.

NREL is the leading U.S. Department of Energy (DOE) laboratory for the development and advancement of renewable energy and has a strong interest in offshore wind and the development of deepwater offshore wind systems. NREL will provide expertise and resources to the DEMOWFLOAT project in assessing the environmental impacts, independent technical performance validation, and engineering analysis.

Principle Power is a Seattle, Washington-based renewable energy company that owns all the intellectual property associated with the WindFloat. In return for NREL's support of the DEMOWFLOAT project, Principle Power will provide NREL with valuable test data from the project that will be used to validate the numerical tools developed by NREL for analyzing offshore wind turbines. In addition, NREL will gain experience and knowledge in offshore wind designs and testing methods through this collaboration.

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NREL and Principle Power will work together to advance floating offshore wind technology, and demonstrate its viability for supplying the world with a new clean energy source.

Summary of Research Results:

Two sets of field measurements were provided for the validation work of the WindFloat, one operating and one parked. A FAST 8 model of the WindFloat system was assembled from the design data provided by PPI and Vestas. The FAST 8 model was first verified with results from PPI's orcaFAST simulations. The verified FAST 8 model was then run for the two sets of field measurement data provided. Relatively good agreement between the simulated and the measured data for the parked condition serves as an initial validation of FAST8 for the WindFloat platform model and mooring line system. However, for the operating case (for power production) since the actual controller was not available through Vestas, we had to use the controller provided by PPI, resulting in a higher degree of uncertainty of the results. To perform a proper validation, a controller that mimics the actual Vestas controller, and more comparison to field measurement data will be needed.

Subject Inventions Listing:

None

Report Date:

03/31/2015

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